

A GUIDE FOR HOMEOWNERS CONSTRUCTING RETAINING WALLS

This pamphlet provides guidelines for homeowners building a timber, reinforced concrete masonry, or reinforced concrete retaining wall. Compliance with minimum requirements and approved plans is subject to verification and inspection

WHAT REGULATIONS GOVERN THE CONSTRUCTION OF RESIDENTIAL RETAINING WALLS

THE CODE OF VIRGINIA

The *Code of Virginia* requires that your retaining wall or any new structure on your property comply with the Virginia Uniform Statewide Building Code (VUSBC). By reviewing plans, issuing permits, and performing field inspections, the Department of Public Works and Environmental Services and the Office of Building Code Services (OBCS) can help you comply with the provisions of the law.

VIRGINIA UNIFORM STATEWIDE BUILDING CODE

Fairfax County is required to enforce the VUSBC, which incorporates by reference the Council of American Building Officials (CABO) One and Two Family Dwelling Code and the Building Officials and Code Administrators (BOCA) National Building Code. These Codes may be purchased from Maps and Publications, located in the Government Center, 12000 Government Center Parkway, Suite 156, Fairfax, Virginia, 22035, telephone **703-324-2974**.

ZONING REQUIREMENTS

Check with the Zoning Permit Review Branch at **703-222-1082** to determine minimum yard and other zoning-related requirements. Minimum yard (setback) requirements, as set forth in the County Zoning Ordinance, represent the minimum distances from the property boundary lines that are required for the location of a structure.

HEALTH DEPARTMENT REQUIREMENTS

Check with the Health Department at **703-246-2201** to determine requirements pertaining to construction on lots served by a septic system or private well. Appropriate clearances from the septic system or well must be maintained. The Health Department is located at 10777 Main Street, Fairfax, Virginia 22030.

COVENANTS AND DEED RESTRICTIONS

Many of the subdivisions and developments in Fairfax County have private deed restrictions and covenants regulating construction beyond the limitations contained in County Ordinances. These amount to contractual agreements and thus the County does not enforce covenants and deed restrictions and is not always aware of their existence. Should you have questions about your development's restrictions, you may obtain information from your homeowners' association, civic association, or the Land Records Office at the Jennings Building (Judicial Center), Third Floor, 4110 Chain Bridge Road, Fairfax, Virginia, telephone **703-591-8580**.

CHESAPEAKE BAY PRESERVATION ORDINANCE

This ordinance was enacted to protect the Chesapeake Bay, one of the world's most productive estuaries, from pollution due to land use and development. All of Fairfax County runoff drains into the Potomac River and ultimately the Chesapeake Bay. In an effort to protect and improve the quality of the bay, its tributaries and state waters, Fairfax County is designated as a Chesapeake Bay Preservation Area. As a result, all construction is reviewed to guarantee that the land-disturbing activity conforms to the performance criteria set forth by the ordinance. Check with the Office of Site Development Services at **703-324-1720** for more information regarding the requirements of the Chesapeake Bay Preservation Ordinance.

WHAT PERMITS ARE REQUIRED

A **building permit** is required for construction of all retaining walls which retain over two feet of earth.

WHERE TO APPLY FOR PERMITS

Application for a building permit can be made at the Permit Application Center, OBCS, Herrity Building, 2nd floor, 12055 Government Center Parkway, Fairfax, Virginia 22035-5504, Monday through Thursday, 8:00 a.m. to 4:00 p.m., Friday 9:15 a.m. to 4:00 a.m., telephone **703-222-0801**.

WHAT DO THE PERMITS COST

Call the Permit Application Center at **703-222-0801** to obtain information regarding the fee structure.

WHO SHOULD APPLY FOR PERMITS

You may secure the permits in your own name; however, if a contractor is to perform the work, Fairfax County strongly suggests that the contractor secure the permit and be listed on the permit as the party responsible for the work. In this way, the County will be in a better position to assist you in gaining compliance with codes if the work is defective. A contractor must be properly licensed in order to obtain a permit.

WHAT TO BRING FOR THE PERMIT APPLICATION

BUILDING PLANS

There are two options with which to achieve a plan submission. The requirements for each are

listed below. When submitting plans, two (2) complete sets are required for review.

1. COMPLETE SET OF PLANS

All structural elements of the retaining wall must be completely detailed and included on a comprehensive set of drawings. The drawings must be to scale, showing all dimensions, and must include the signature and seal of a Professional Engineer or Registered Architect. The minimum acceptable scale is 1/4 inch = 1 foot and the following information must be included.

- Code and code year used for the design, CABO One & Two Family Dwelling Code or the BOCA National Building Code.
- General notes including, but not limited to the following, when applicable:
 - Concrete compressive strength.
 - Concrete masonry and mortar specifications.
 - Reinforcing steel grade.
 - Drainage specifications.
 - Lateral earth pressure and soil type used in design.
 - Lumber species and grade.
- Elevation of retaining wall showing all construction, control and/or expansion joints.
- Sections and details showing the following, minimum, when applicable:
 - Wall and footing dimensions.
 - Typical expansion and control joint.
 - Reinforcing steel size and spacing.
 - Timber, deadman size and spacing.
 - Timber connection requirements.
 - Bond beam requirements.
 - Horizontal joint reinforcement.
 - Head and bed joint dimensions.
 - Reinforcing steel cover dimensions.
 - Drain pipe size and weep hole spacing.
- Guardrail detail(s). Guardrail is required when retaining walls with differences in grade level on either side of the wall in excess of 4 feet are located 2 feet or closer to a walk, path, parking area or driveway on the high side. Guardrail shall not be less than 36 inches in height; shall be constructed to not allow the passage of a 4 inch diameter sphere; and shall not have an ornamental pattern which would provide a ladder effect. Guardrail shall be designed for a 200 pound concentrated load anywhere along the top and a 50 pound concentrated load on a square foot area within the infill area. Plantings, shrubs, hedges, etc. do not constitute a guardrail.
- *Special Inspections Form.* Walls retaining 10 feet of earth or more or walls with deep foundations are considered a Critical Structure and require a *Special Inspection Form* to be completed and attached to each set of drawings. This form may be obtained at the Building Plan Review Division, the Critical Structures Section or the Permit Application Center. A Critical Structures meeting is also required prior to the issuance of a building permit. To schedule a meeting call the Critical Structures Section at **703-324-1050**.

- If a manufactured system is proposed for the retaining wall construction, in addition to the above requirements, provide the manufacturer's information and specifications, the research or evaluation report by a model code agency and the design calculations signed and sealed by the Professional Engineer or Registered Architect responsible for the design.

ALL DRAWINGS MUST BE PREPARED TO SCALE IN INK OR EQUAL ON SHEETS NO SMALLER THAN 11" x 17".

2. FAIRFAX COUNTY TYPICAL RETAINING WALL DETAILS

A copy of the Fairfax County Typical Retaining Wall Details is attached. These details may be used in lieu of submitted drawings for review. The building permit application must reflect the intended use of these details. Retaining walls which deviate from the typical details, exceed the maximum height as shown in the details (in no case shall the wall retain more than 5 feet of earth) or are subject to surcharge loads require a full plan submission and review by the Building Plan Review Division. **The use of the *Fairfax County Typical Retaining Wall Details* for a tiered or stacked retaining wall system is strictly prohibited.**

SOILS INFORMATION

Fairfax County contains many different types of soils that may affect the design parameters of your retaining wall. The type of soil on your property is verified by the Site Permits Section as a part of the review process. There are two soil classifications that require additional information prior to the issuance of a building permit. They are:

- **Problem soils:** a problem soil is a soil type which may have a high water table, expansive clays, low bearing capacities, frost heave potential or other behavioral problems. If your property contains a problem soil, you may need to hire a geotechnical engineer to investigate the soil. In addition, you may need to have the foundation system professionally designed to take the soil's behavior into consideration. The details contained in the Fairfax County Typical Retaining Wall Details may not be used if your property is in a problem soil area.
- **Unmapped soils:** the County contains areas where the soils have not been identified on the soil maps. If your property falls within one of these unmapped areas you must hire a soil scientist to identify the soil or you must design the foundation for a worst case soil situation. A helpful brochure, entitled "Residential Construction in Unmapped Soils Areas," is available at the Site Permits Section on the second floor of the Herrity Building.

When the proposed alteration requires a grading plan, soils information will be incorporated into the grading plan submission. Professionally designed foundations require an original seal and signature of a Professional Engineer or Architect registered in the Commonwealth of Virginia. Construction performed in problem soils and unmapped soils areas requires a private geotechnical engineer to perform and certify all soil-related inspections. For more information or to determine if the soils on your property have been mapped, please contact the Site Permits Section at **703-324-1510**.

HOUSE LOCATION PLATS

- Two (2) copies of your house location plat are required to accompany a building permit application.
- Sketch, to scale, the location of the retaining wall(s) on the copies of the house location plat, and include the distance to the lot lines.
- If County easements are present on a lot, no construction shall encroach into the ground or air space of the easement.
- If you do not have a copy of your house location plat, review your residential loan closing documents to see if one is included there. You may also obtain a copy by calling the Zoning Permit Review Branch or by visiting their office; **please note:** not all plats are available. If the County does not have a copy of your house location plat, contact the lending institution from which the mortgage was obtained.

WHAT IS THE PERMIT PROCESS

BUILDING PERMIT PROCESS

The review process begins when the plat and retaining wall drawings (if applicable) are complete and have been submitted, along with a building permit application, to the Permit Application Center on the second floor of the Herrity Building. The permit will be "logged in," a permit number will be assigned to identify the project and a plan tracking number will be assigned to identify the drawings, if applicable. The building permit application will be returned to you for obtaining the approval signatures from the applicable offices required for permit issuance; the permit technicians will direct you to the appropriate agencies. The signatures are placed on the lines adjacent to their corresponding departments as listed on the building permit application. The applicable departments for a retaining wall are listed below.

- *Zoning:* the Zoning Permit Review Branch will sign off after the plat has been reviewed for zoning related issues.
- *Site Permits:* the Site Permits Section will sign off after the plat has been reviewed for site related issues. Site Permits will also determine compliance with the Chesapeake Bay Preservation Ordinance. **Please note:** a site inspection is required prior to permit issuance for retaining walls that are not reflected on an approved grading plan. A grading plan may be required as a result; contact the Site Permits Section, telephone **703-324-1510** for more information.
- *Health Dept.:* the Health Department will sign off after the plat has been reviewed for clearances to existing wells and/or septic tanks if they exist on the property.
- *Building Review:* the Building Plan Review Division will sign off only after all other signatures have been obtained and after the retaining wall plans have been reviewed and approved. (A Building Review is not required if the retaining wall is constructed in accordance with the Fairfax County Typical Retaining Wall Details.)

Most residential retaining walls which are not considered critical structures and do not require a pre-permit issuance site inspection may be eligible for the Walk-Thru Program. The Walk-Thru Program allows the permit holder to walk the plat, drawings and building permit application to the approving agencies for review with permits usually being issued on the same day.

WHAT ARE THE REQUIREMENTS FOR PUBLIC UTILITIES

Call "[Miss Utility](#)" at **1-800-257-7777** before excavating to ensure that the construction does not interfere with underground utility lines. "Miss Utility" is a free service to anyone who is planning to excavate. Utility companies support "Miss Utility" to prevent damage to their buried lines. Call at least 48 hours prior to excavating. The various companies will mark the path of underground utilities on the property. If you fail to contact Miss Utility and damage occurs, you will be liable for all costs of repair.

WHEN INSPECTIONS ARE REQUIRED

Inspections are required by the VUSBC to ensure that the structure conforms to the approved plans and meets the intent of the VUSBC for structural and other safety considerations.

The number of inspections varies depending on the type of retaining wall constructed. The Inspection Timing Checklist on the following page outlines the required inspections and the stage of construction in which the wall should be prior to requesting an inspection.

Please note: any retaining wall built on a problem soil is required to have all foundation inspections performed by a licensed private geotechnical engineer. See the Inspection Timing Checklist on the following pages or contact the Residential Inspections Division at **703-631-5101** for further information.

A COPY OF THE APPROVED PLAT AND PLANS OR TYPICAL RETAINING WALL DETAILS MUST BE ON THE JOB SITE AND MUST BE AVAILABLE TO THE INSPECTOR DURING EACH INSPECTION OR NO INSPECTIONS WILL BE PERFORMED.

WHEN AND WHERE TO CALL FOR INSPECTIONS

Pursuant to the VUSBC, it is the responsibility of the permit holder or the permit holder's representative to notify the county when the stages of construction are reached that require an inspection. All ladders, scaffolds and test equipment required to complete an inspection or test shall be provided by the property owner, permit holder or their representative.

The Inspection Request Center's telephone number is **703-222-0455**. Please call between the hours of 8:00 a.m. and 4:20 p.m., Monday through Friday, except on County holidays. Please have your permit number available to give to the inspection request operator.

Customers may also use the telephone Automated Inspection Request System (AIRS), at **703-222-2474**, or [Building Code Services Online](#), 24 hours a day, seven days a week, for scheduling and canceling of inspections. Requests made prior to 11:59 p.m. will be scheduled for the next workday.

FOR FURTHER INFORMATION ON PERMIT REQUIREMENTS FOR RETAINING WALLS CONTACT THE PERMIT APPLICATION CENTER AT 703-222-0801. FOR FURTHER INFORMATION CONCERNING CONSTRUCTION REQUIREMENTS, PLEASE CONTACT THE BUILDING PLAN REVIEW DIVISION AT 703-222-0114.

INSPECTION TIMING CHECKLIST FOR RETAINING WALLS

TYPE OF INSPECTION	INSPECTION PERFORMED BY	WORK TO BE COMPLETED PRIOR TO INSPECTION REQUEST	APPROVAL REQUIRED PRIOR TO PROCEEDING WITH
TIMBER RETAINING WALLS			
Retaining Wall	Residential Inspector	Timber wall and deadman placement.	Placing backfill.
Final	Residential Inspector	All backfilling procedures and construction of guardrail, if required.	
REINFORCED CONCRETE MASONRY OR CONCRETE RETAINING WALLS			
Retaining Wall (footing)	Residential Inspector or Geotechnical Engineer (in <u>Problem Soils Areas</u>)	The area must be prepared for pouring concrete and the reinforcing steel must be placed.	Placing concrete in the footing forms.
Retaining Wall	Residential Inspector	Concrete blocks or forms and reinforcing steel must be in place.	Placing concrete in block cells or in forms.
Retaining Wall (waterproofing)	Residential Inspector	All parging and waterproofing must be completed and drain pipe installed and tied to the proper outfall. If the approved permit application indicates a problem soils area, backfill material and placement shall be certified by a geotechnical engineer.	Placing backfill.
Final	Residential Inspector	All backfilling procedures and construction of guardrail, if required.	

FAIRFAX COUNTY AGENCIES TO CONTACT FOR INFORMATION ON RETAINING WALLS

REQUIREMENTS FOR PERMITS

Permit Application Center
Office of Building Code Services
Department of Public Works & Environmental Services
12055 Government Center Parkway
Fairfax, Virginia 22035-5504
703-222-0801

REQUIREMENTS FOR SEPTIC SYSTEMS/WELLS

Division of Environmental Health
Department of Health

10777 Main Street
Fairfax, Virginia 22030
703-246-2201

REQUEST INSPECTIONS
Inspection Request Center
Office of Building Code Services
Department of Public Works & Environmental Services
12055 Government Center Parkway
Fairfax, Virginia 22035-5504
703-222-0455 (voice)
703-222-2474 (AIRS)

SUBDIVISION AND DEVELOPMENT RESTRICTIONS
Land Records Office
The Jennings Building, (Judicial Center) Third Floor
4110 Chain Bridge Road
Fairfax, Virginia 22030
703-591-8580

HOW TO PREVENT DAMAGE TO BURIED UTILITY LINES
"Miss Utility" (Free Service to the Permit Holder Who is Planning to Excavate)
1-800-257-7777

MINIMUM YARD REQUIREMENTS
Zoning Permit Review Branch
Zoning Administration Division
Office of Comprehensive Planning
12055 Government Center Parkway
Fairfax, Virginia 22035-5508
703-222-1082

Fairfax County Typical Retaining Wall Details
Designed in accordance with the 1996 Virginia Uniform Statewide Building Code.

NOTE: THE USE OF THIS PACKAGE IN LIEU OF SUBMITTED DRAWINGS APPLIES TO TIMBER, REINFORCED CONCRETE MASONRY AND REINFORCED CONCRETE RETAINING WALLS WITH HEIGHTS NO GREATER THAN SHOWN HEREIN AND WITH NO SURCHARGE LOADING. THE USE OF THE *FAIRFAX COUNTY TYPICAL RETAINING WALL DETAILS* FOR A TIERED OR STACKED RETAINING WALL SYSTEM IS STRICTLY PROHIBITED. RETAINING WALLS MUST BE CONSTRUCTED IN STRICT CONFORMANCE WITH THE DETAILS CONTAINED HEREIN. A COPY OF THESE RETAINING WALL DETAILS IS REQUIRED TO BE ON THE JOB SITE AND AVAILABLE TO THE INSPECTOR DURING THE CONSTRUCTION AND INSPECTION PROCESS.

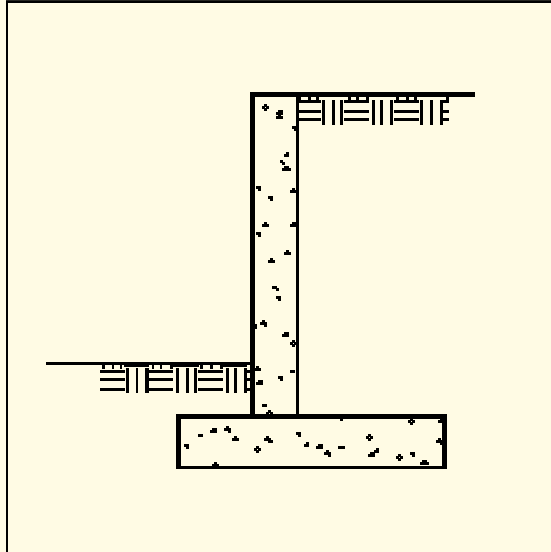


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Reinforced Concrete Masonry Retaining Walls

Reinforced Concrete Retaining Walls

TIMBER RETAINING WALLS

GENERAL NOTES:

1. All lumber shall be pressure treated 0.4 cca minimum, southern pine #2 or better.
2. All spikes shall be 60d or equivalent, corrosion-resistant, and driven into predrilled holes. Spikes shall be of sufficient length to penetrate the base member a minimum of 2".
3. Member joints shall be staggered a minimum of 3'-6" from joints of the layers above and below.

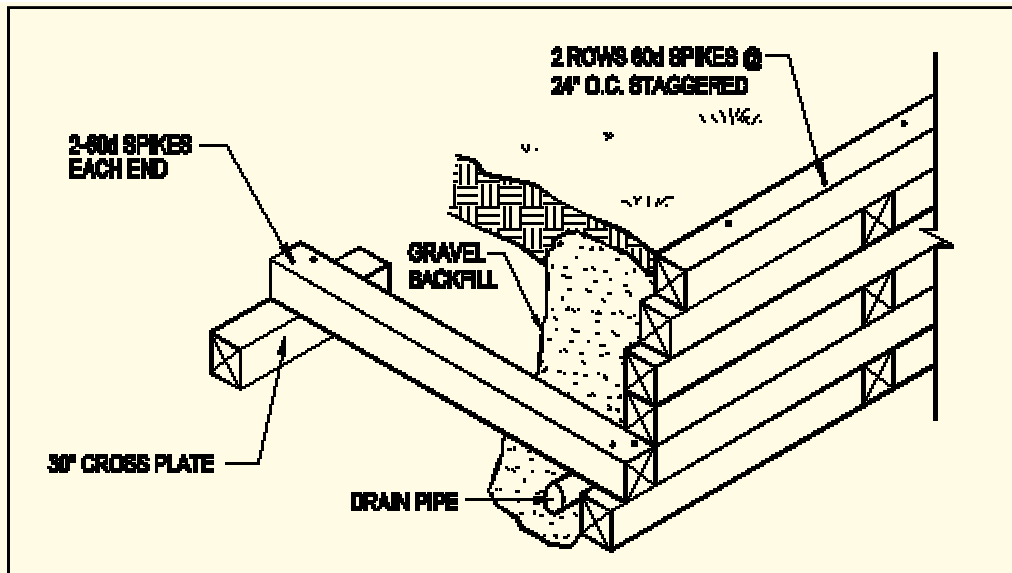


FIGURE 1: TYPICAL TIMBER RETAINING WALL DETAIL

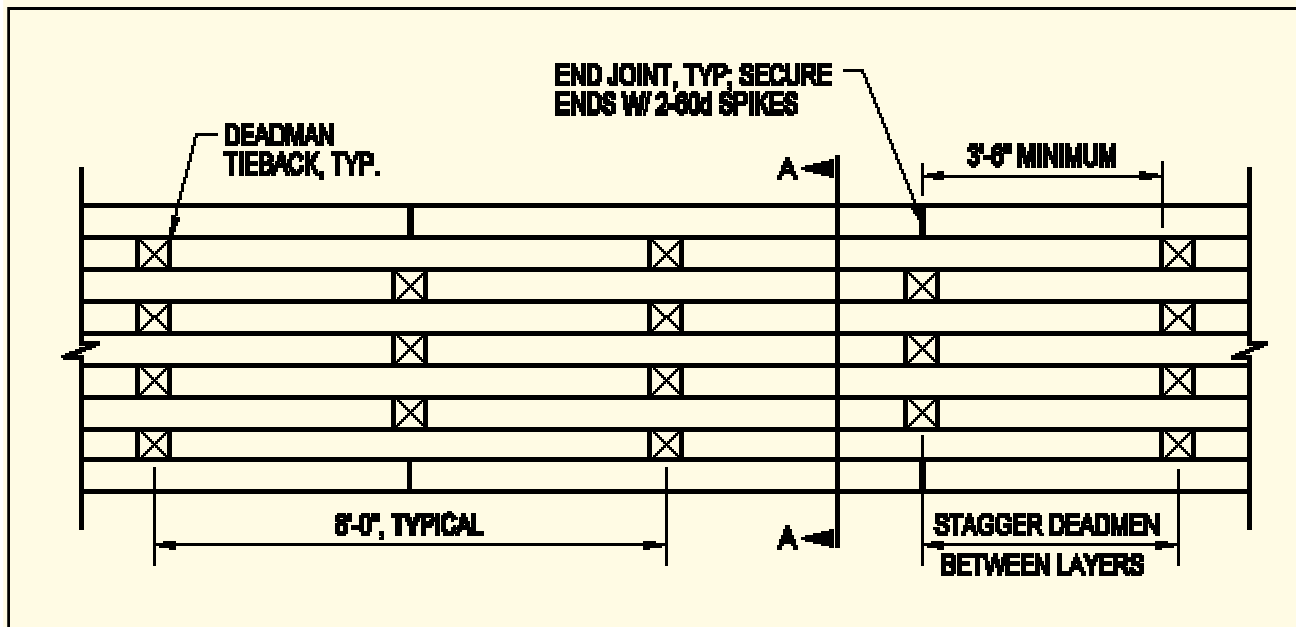


FIGURE 2: TYPICAL ELEVATION

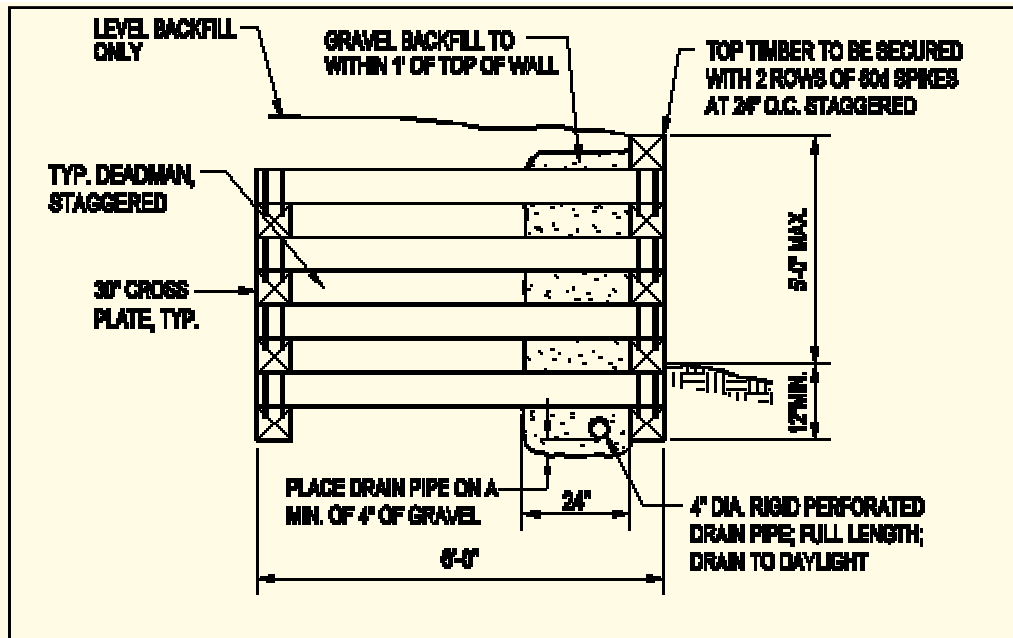


FIGURE 3: TYPICAL SECTION A-A

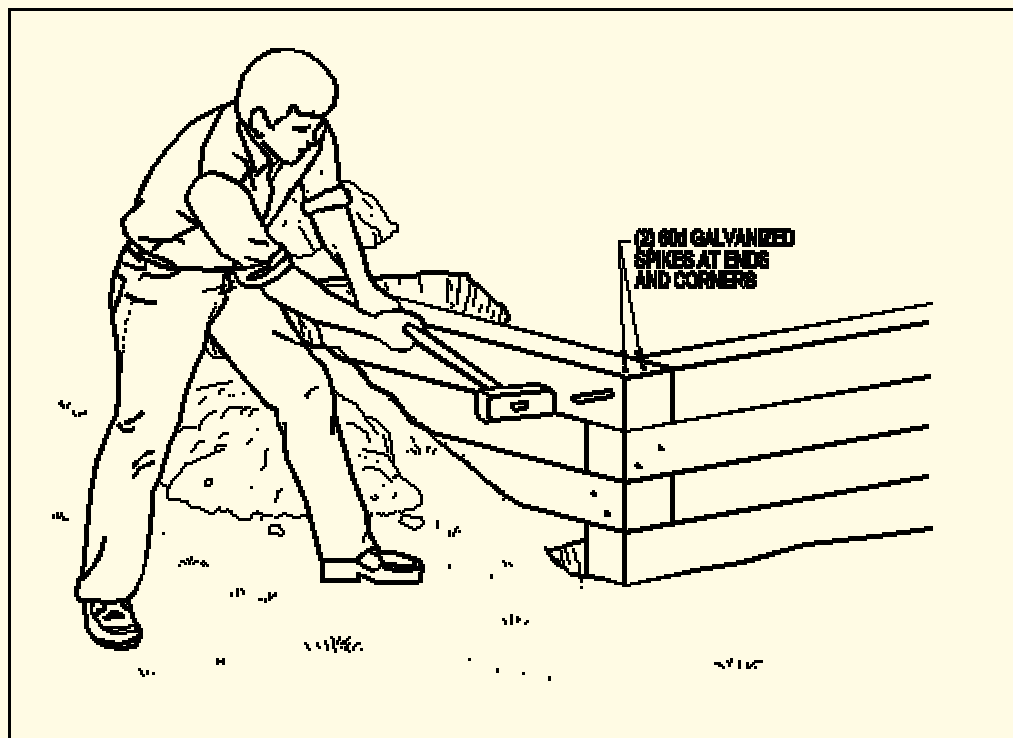


FIGURE 4: CORNER DETAIL

REINFORCED CONCRETE MASONRY RETAINING WALLS

GENERAL NOTES:

1. The minimum concrete compressive strength at 28 days shall be 3,000 PSI.
2. Materials used to produce concrete shall comply with the requirements of ACI 318.
3. Reinforcing steel shall comply with the requirements of ASTM A615 and shall have a yield strength of 60,000 PSI.
4. Concrete masonry blocks shall comply with the requirements of ASTM C90.
5. All joint reinforcement, ties and other accessories shall be resistant to corrosion.
6. All head and bed joints shall be 3/8" thick. Bed joints of the starting course over the concrete foundation may be between 1/4" and 3/4".
7. Mortar for masonry construction shall conform to the requirements of ASTM C270.
8. Backfilling against reinforced concrete masonry retaining walls shall not be permitted until at least 7 days after placing concrete or grout in respective cores. Where heavy equipment is used in backfilling walls designed to resist earth pressure only, such equipment shall not approach closer to the top of the wall than a distance equal to the height of the wall. Care shall also be taken to avoid exerting large impact forces on the wall as caused by a large mass of moving earth.
9. Reference: National Concrete Masonry Association.

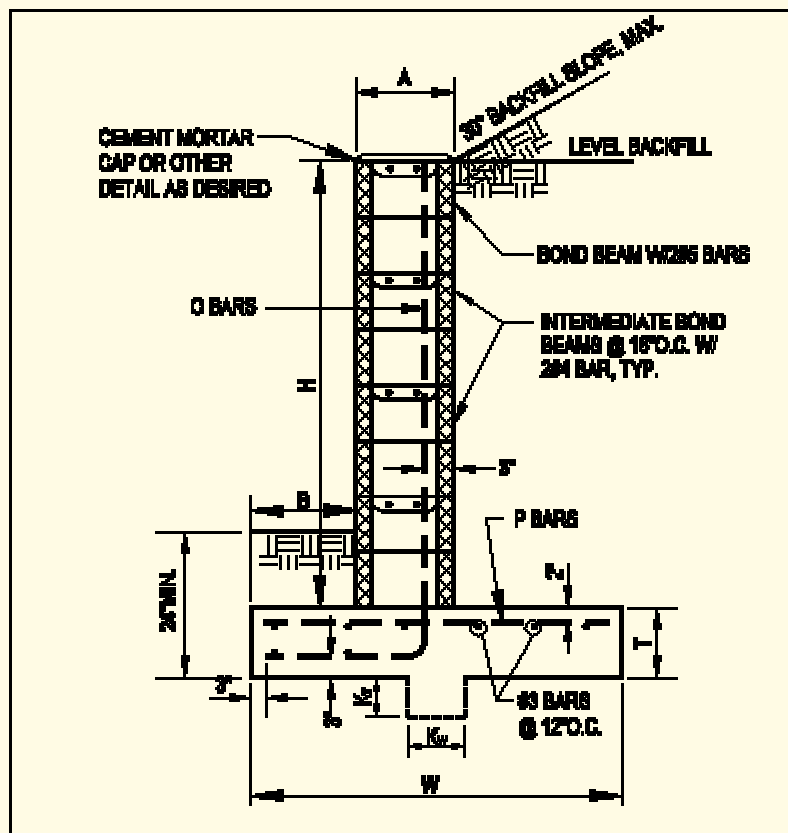


FIGURE 5: TYPICAL MASONRY WALL SECTION

TABLE 1: TYPICAL MASONRY WALL SPECIFICATIONS

Dimensions					Key		Reinforcing Bars	
H	A	B	W	T	K _T	K _W	O	P
Level Backfill								
3'-4"	8"	8"	2'-4"	9'	Not Req'd.		#3@24"O.C.	#3@27"O.C.
4'-0"	8"	10"	2'-9"	9"	Not Req'd.		#4@24"O.C.	#3@27"O.C.
4'-8"	8"	12"	3'-3"	10"	Not Req'd.		#5@24"O.C.	#3@27"O.C.
5'-4"	8"	14"	3'-8"	10"	Not Req'd.		#5@24"O.C.	#4@30"O.C.
6'-0"	8"	15"	4'-2"	12"	Not Req'd.		#6@24"O.C.	#4@25"O.C.
Sloped Backfill								
3'-4"	12"	8"	2'-4"	9"	6"	9"	#3@32"O.C.	#3@27"O.C.
4'-0"	12"	10"	2'-9"	9"	6"	9"	#3@32"O.C.	#3@27"O.C.
4'-8"	12"	12"	3'-3"	10"	6"	9"	#4@32"O.C.	#3@27"O.C.
5'-4"	12"	14"	3'-8"	10"	6"	9"	#4@24"O.C.	#3@25"O.C.
6'-0"	12"	17"	5'-0"	12"	8"	9"	#6@24"O.C.	#6@20"O.C.

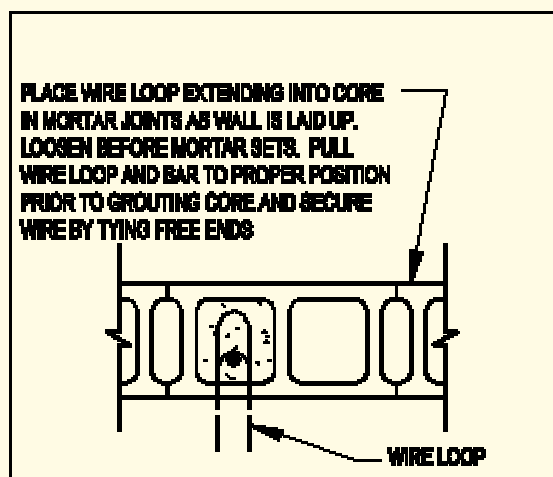


FIGURE 6: VERTICAL REINFORCEMENT TIE HOLD DETAIL

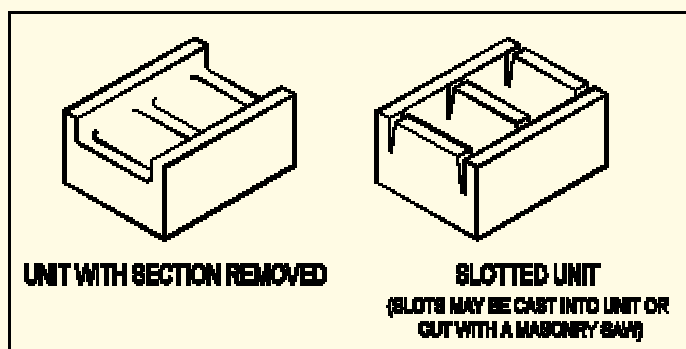


FIGURE 7: TYPICAL BOND BEAM BLOCK TYPES

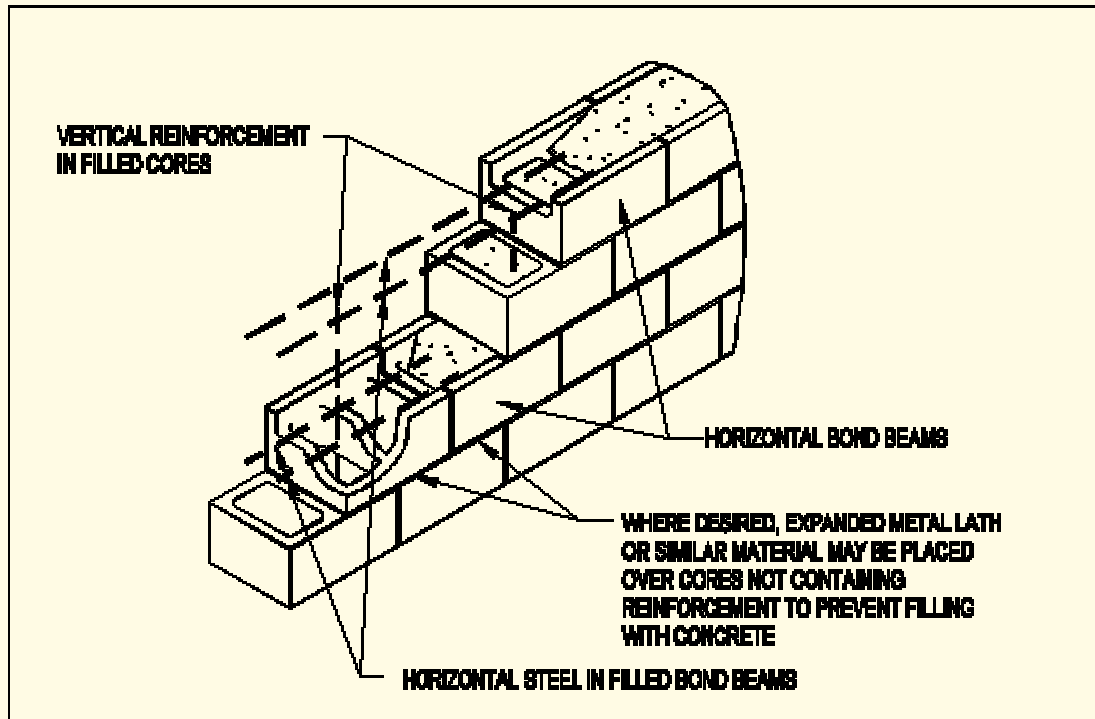


FIGURE 8: TYPICAL REINFORCEMENT DETAIL

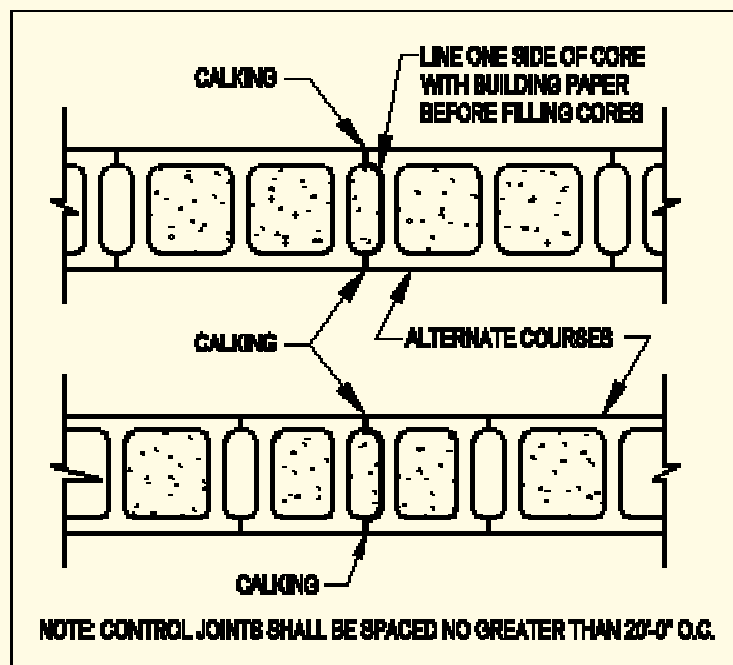


FIGURE 9: TYPICAL CONTROL JOINT DETAIL

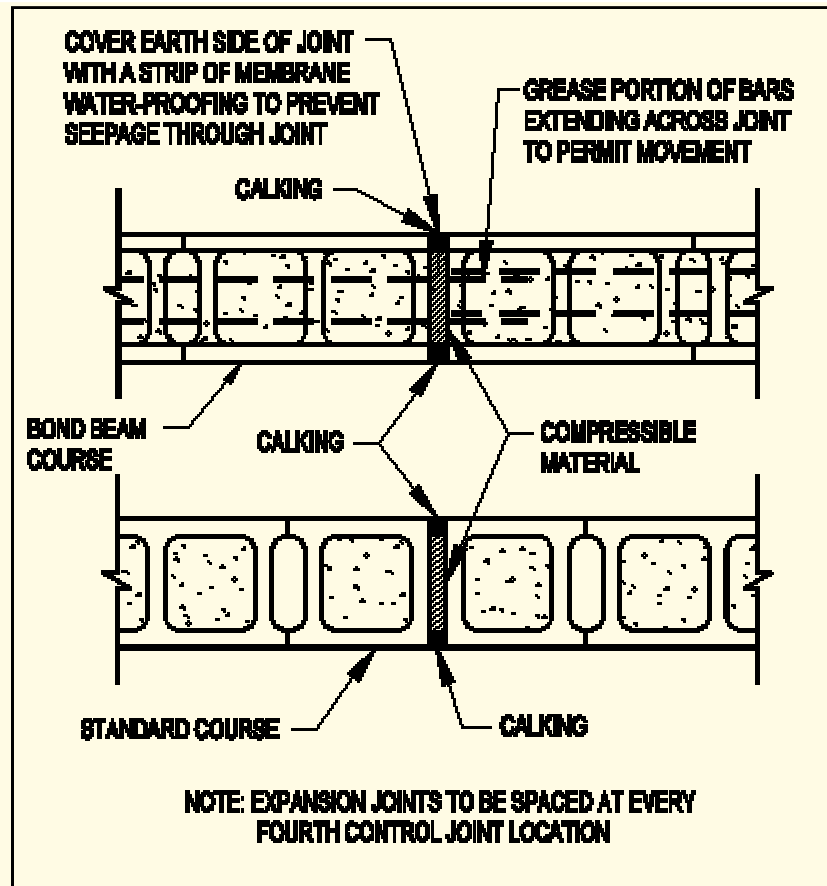


FIGURE 10: TYPICAL EXPANSION JOINT DETAIL

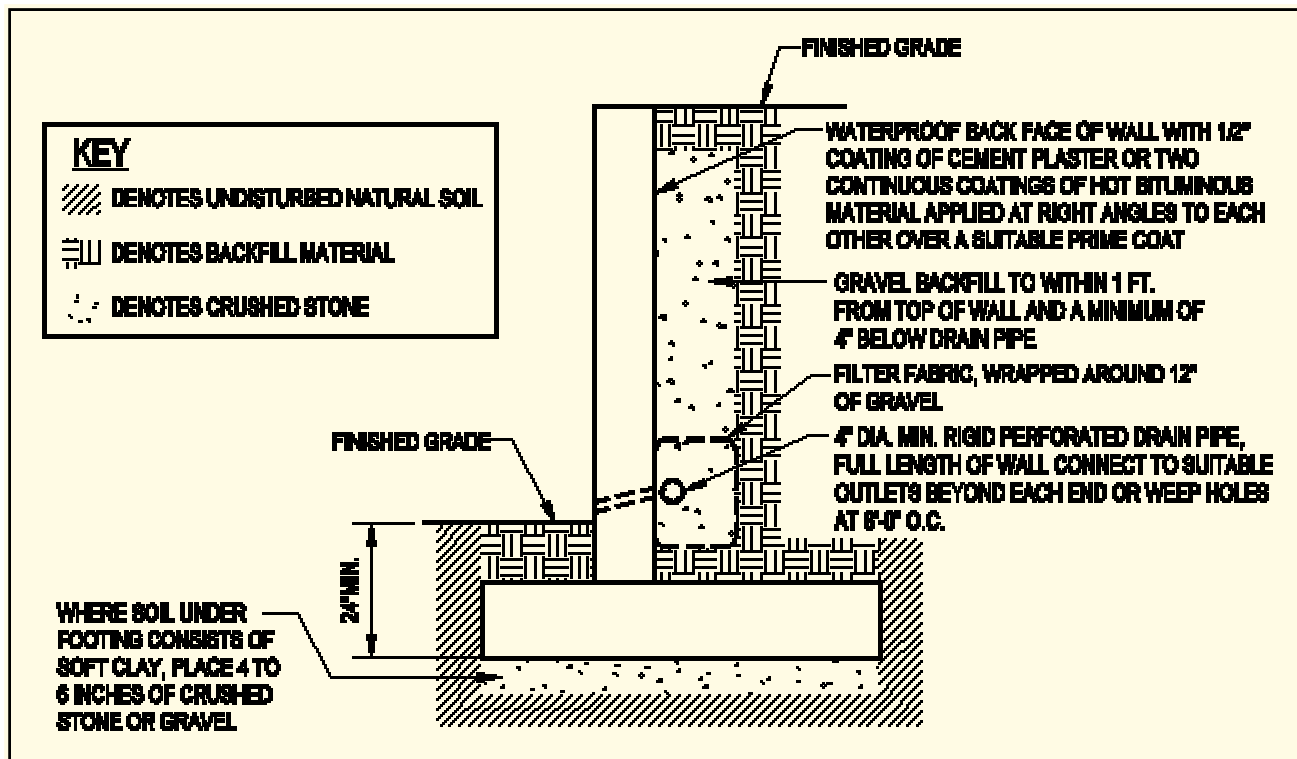


FIGURE 11: TYPICAL BACKFILL AND DRAINAGE DETAIL

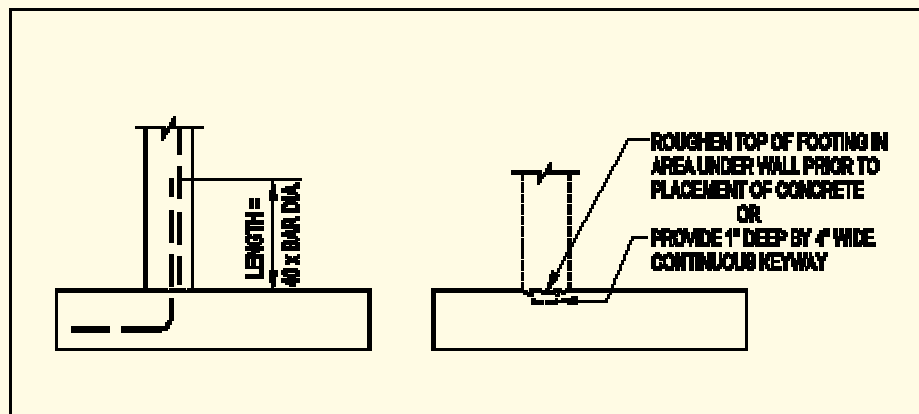


FIGURE 12: TYPICAL DOWEL AND KEYWAY DETAIL

REINFORCED CONCRETE RETAINING WALLS

GENERAL NOTES:

1. The minimum concrete compressive strength at 28 days shall be 3,500 PSI.
2. Materials used to produce concrete shall comply with the requirements of ACI 318.
3. Reinforcing steel shall comply with the requirements of ASTM A615 and shall have a yield strength of 60,000 PSI.

4. Backfilling against reinforced concrete retaining walls shall not be permitted until the concrete has reached its 28 day strength. Where heavy equipment is used in backfilling walls designed to resist earth pressure only, such equipment shall not approach closer to the top of the wall than a distance equal to the height of the wall. Care shall also be taken to avoid exerting large impact forces on the wall as caused by a large mass of moving earth.
5. Reference: Concrete Reinforcing Steel Institute.

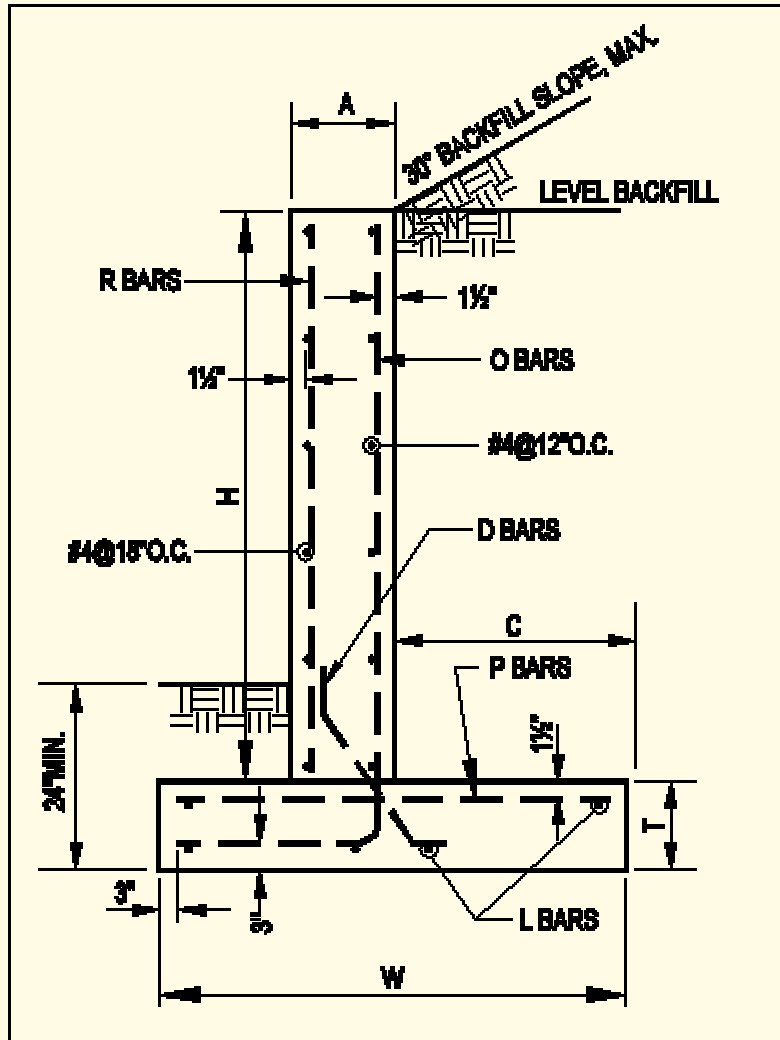


FIGURE 13: TYPICAL CONCRETE WALL SECTION

TABLE 2: TYPICAL CONCRETE WALL SPECIFICATIONS

Dimensions	Reinforcing Bars
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4'-0"	8"	1'-3"	2'-7"	12"	#4@12"O.C.	#4@13"O.C.	#4@13"O.C.	#5@13"O.C.	5#4
5'-0"	8"	1'-8"	3'-1"	12"	#4@12"O.C.	#4@13"O.C.	#4@13"O.C.	#5@13"O.C.	5#4
6'-0"	8"	2'-0"	3'-7"	12"	#4@12"O.C.	#4@13"O.C.	#4@13"O.C.	#5@13"O.C.	5#4
Sloped Backfill									
3'-0"	8"	1'-0"	2'-2"	12"	#5@9"O.C.	#4@13"O.C.	#4@13"O.C.	#5@13"O.C.	5#4
4'-0"	8"	1'-5"	2'-9"	12"	#5@9"O.C.	#4@13"O.C.	#4@13"O.C.	#5@13"O.C.	5#4
5'-0"	15"	1'-2"	3'-2"	15"	#5@9"O.C.	#5@11"O.C.	#4@11"O.C.	#5@11"O.C.	5#5

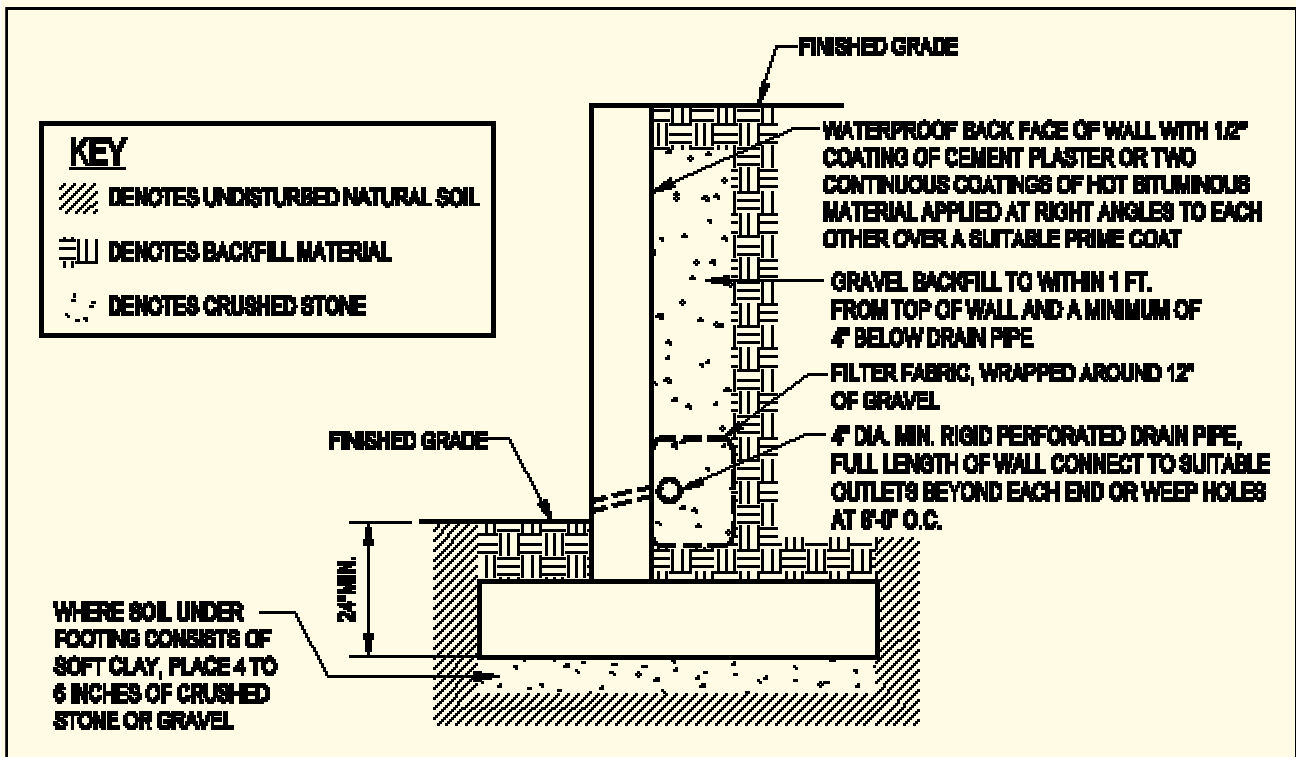
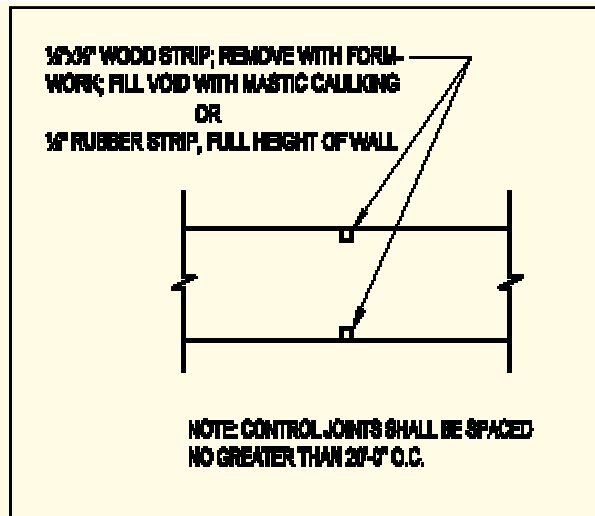
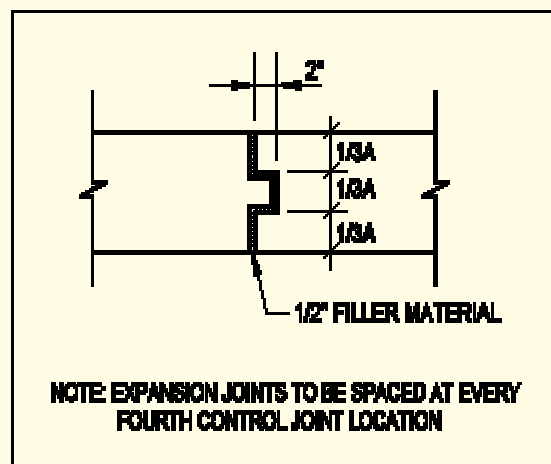


FIGURE 14: TYPICAL BACKFILL AND DRAINAGE DETAIL



**FIGURE 15: TYPICAL CONTROL JOINT
DETAIL**



**FIGURE 16: TYPICAL EXPANSION
JOINT DETAIL**

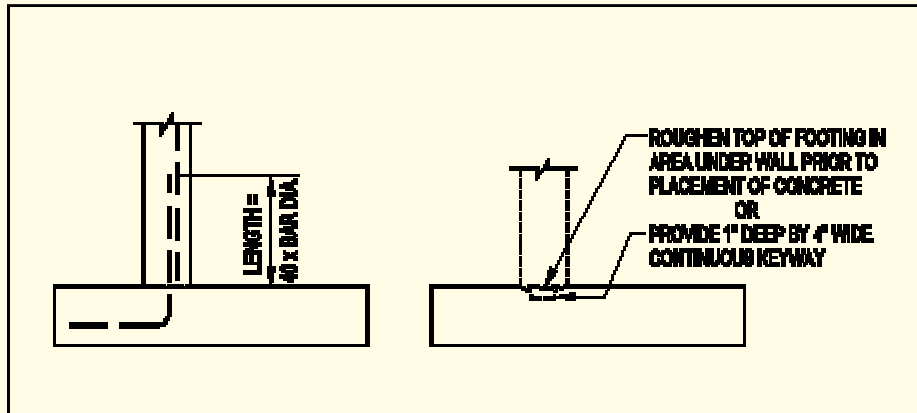
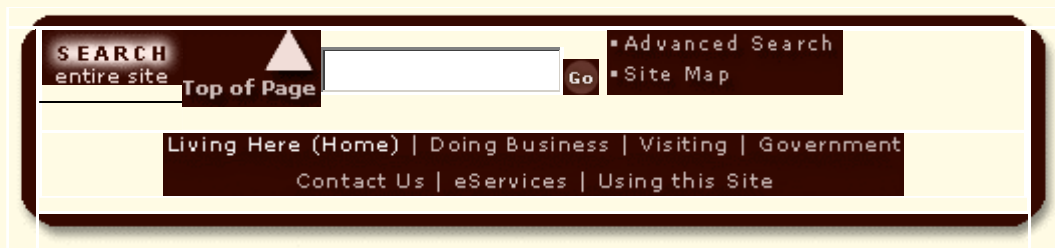


FIGURE 17: TYPICAL DOWEL AND KEYWAY DETAIL



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Last Modified: Wednesday, April 30, 2003